The presently claimed invention is distinct from Ying. In the present claim 1, a precursor coating is applied to at least a first side of a fuel cell plate.

The present specification, at page 5, lines 13-14, states that "[e]ach of the fuel cells 102 includes a multi-layer active portion 104 sandwiched between a pair of bipolar plates 106 or between a bipolar plate 106 and an end plate 108." Further, the active portion 104 is described as including a membrane electrolyte assembly (MEA) 110 disposed between two backing layers 112. The MEA 110 may include a polymer electrolyte membrane (PEM) 114 disposed between an anode 116 and a cathode 118. As can be seen from the above description, the active portion is different from the bipolar or end plates 106, 108.

At page 6, lines 23-24, the present application discloses that a coating 132 is applied to either or both surfaces of the fuel cell plates 106 and 108. As discussed at page 5, lines 24-26, the purpose of the coating 132 is to prevent the mixing of disparate fluid streams during the operation of the fuel cell. Furthermore, at page 2, line 27, the plates are described as gas-impermeable and as having channels that distribute fluids to the active portion. From this, it is apparent that the fuel cell plates 106 and 108 and coating 132 are not porous to gases or liquids; otherwise, the fuel cell would not operate correctly.

Despite the Examiner's assertion to the contrary, Ying does not disclose the application of a coating to a fuel cell plate. In the abstract, as the Examiner acknowledges, Ying discloses that the protective coating is applied to a separator. At column 1, lines 47-50, Ying defines a separator as the part of the electrolyte element that separates or insulates the anode from the cathode. The electrolyte element is also disclosed to include an aqueous or non-aqueous electrolyte in the pores of the separator. See column 1, lines 47-50. Ying further makes clear, at column 1, lines 36-38, that the electrolyte element is interposed between the anode and the cathode. From the abstract and background of Ying, it is clear that that electrolyte element and the protective coating are roughly analogous only to the MEA as discussed in the present application, not to a plate as claimed herein. The MEA 110 is disposed between the anode and the cathode in the same way that the electrolyte element of Ying is disposed between the anode and the cathode. Because the electrolyte element includes the protective coating, the protective coating of Ying is also disposed between the anode and the cathode. In contrast, the coating 132 of the present invention is not disposed

between the anode and the cathode but rather is disposed on the plates 106 and 108 that separate respective active portions 104 from each other. In sum, the protective coating of Ying is utilized in a wholly different area of the fuel cell from the coating 132 in the present application.

In addition, the protective coating of Ying is porous. The Examiner's attention drawn to column 13, line 65 to column 14, line 22, where Ying states that "[s]uitable polymeric protective coatings should add flexibility and toughness to the separator while at the same time allowing, cations, such as lithium ions, to pass through the separator." Furthermore, at column 14, line 53, Ying acknowledges that the protective coating has a certain required amount of porosity. A coating that is porous can hardly function in place of a coating that is selected specifically because it is non-porous.

Applicants also respectfully disagree that the microporous layers of Ying's invention would read on a "plate" and thus support anticipation of the present invention. Although comprised nominally of metal oxides, the microporous layers in Ying are in fact formed from liquid solutions, (e.g., Ying column. 20, lines 63-64;, column 21, lines 10-11) which are "dried" (e.g., column 21, line 18) to form very thin "coating" layers that contain pores that are substantially continuous across the entire layer (column 16, lines 50-54). The microporous layers readily absorb liquids, as indicated by the calculation of pore volume by measuring the increase in weight of the layer upon addition of liquid (e.g,. column. 16, line 65-column 17, line 11). Due to its porosity, the microporous layer is further described as functioning as an "ultrafiltration membrane" column. 18, line 14). Nowhere does Ying teach or suggest that its microporous layers are "plates", nor would one of ordinary skill in the art consider them "plates" in view of their membrane-like nature and porosity.

Thus, it can be seen that Ying discloses a coating for use in a completely different area and with a completely different function from the coating 132 of the presently claimed invention.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. See MPEP §2131. Contrary to the assertion of the Examiner, at least the feature of a non-porous coating on a fuel cell plate is not disclosed, taught or suggested in Ying, so the rejection is unsupported by

the art and should be withdrawn.

For at least this reason, claim 1 is allowable over the applied art. Claims 2-5, which depend from claim 1, are likewise allowable over the applied art. Withdrawal of the rejection is respectfully requested.

Rejection of claims 1, 4 and 5 under 35 U.S.C. §102(e)

The Examiner rejected claims 1, 4 and 5 under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,337,120 to Sasaki et al. ("Sasaki"). This rejection is traversed.

The presently claimed invention is distinct from Sasaki. The problems with Sasaki are similar to the problems of Ying. Despite the Examiner's assertion to the contrary, Sasaki does not disclose the application of a coating to a fuel cell plate. As acknowledged by the Examiner, Sasaki discloses a gasket for fuel cells that is made integral to porous carbon plates. See column 3, lines 28-32. Sasaki discloses that the porous carbon plate may be used "as an electrode or separator for fuel cells." See column 4, line 22. Sasaki uses the term 'separator' in the same way Ying used the term; that is, a porous layer disposed between the anode and the cathode, which together make up an electrode, the active portion. See column 1, lines 19-40. As demonstrated above, coating 132 of the present invention is applied plates 106 and 108, not to the active portion 104. Furthermore, coating 132 is applied to a surface that is non-porous. Thus, it can be seen that Sasaki discloses a coating for use in a completely different area and with a completely different function from the coating 132 of the presently claimed invention.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference. See MPEP §2131. Contrary to the assertion of the Examiner, at least the feature of a non-porous coating on a fuel cell plate is not disclosed, taught or suggested in Sasaki, so the rejection is unsupported by the art and should be withdrawn.

For at least this reason, claim 1 is allowable over the applied art. Claims 4 and 5, which depend from claim 1, are likewise allowable over the applied art. Withdrawal of the rejection is respectfully requested.

Rejection of claims 15-17 under 35 U.S.C. §103

The Examiner rejected claims 15-17 under 35 U.S.C. §103 as being obvious over Sasaki in view of U.S. Patent No. 4,609,686 to Giordano et al. ("Giordano"). This rejection is respectfully traversed.

The problems with Sasaki discussed above with respect to the anticipation rejection apply with equal force to the present obviousness rejection.

Applicants agree that Sasaki does not disclose the use of epoxy nitrile resins. Giordano, however, does not fill all the gaps in Sasaki. As demonstrated above, Sasaki discloses the use of a gasket only on a porous carbon plate. Combining Sasaki with Giordano will not produce the presently claimed invention. Using the materials disclosed in Giordano to make the gasket of Sasaki would still produce a gasket that is integral to a porous carbon separator. Giordano does not disclose or suggest moving the gasket from the porous carbon separator to a non-porous fuel cell plate. Thus, Sasaki and Giordano do not combine to form the presently claimed invention.

Furthermore, Giordano does not disclose gasket materials that are the same as those in the presently claimed invention. As used in the present claims, epoxy nitrile resins include an epoxy resin and an acrylonitrile butadiene copolymer, as can be seen at page 18, lines 5-8 of the present specification. Giordano, however, discloses the use of epoxy resins in combination with epoxy-nitrile monomers. See column 2, lines 50-53. Giordano defines an epoxy-nitrile monomer, at column 6, lines 10-19, as "any chemical substance containing both an epoxy group [inline figure of epoxy group] and a nitrile group (CN) and is capable of polymerization." As can be seen, Giordano combines an epoxy resin with an epoxy-nitrile monomer, in contrast to the present invention where an epoxy resin is combined with an acrylonitrile butadiene copolymer. One skilled in the art would understand the distinction between an epoxy-nitrile monomer and an acrylonitrile butadiene copolymer. In sum, Giordano does not disclose or suggest the epoxy nitrile resin of the present claims. Thus, Sasaki and Giordano do not combine to form the presently claimed invention.

Furthermore, there is no motivation to combine Sasaki and Giordano. Sasaki states, at column 8, lines 23-26, "sealing materials (or gaskets) are made of elastic materials so that sealing materials can sealingly face-contact with another plate at a relatively low contact

pressure..." Thus, Sasaki teaches away from any gasket material that is not elastic. The materials disclosed in Giordano, however, are not elastic. They are specifically selected because they have "excellent hardness." See column 1, line 16. Thus, one skilled in the art would not be motivated to use the hard materials of Giordano in the apparatus of Sasaki because of Sasaki's need for an elastic gasket material.

Because Sasaki and Giordano do not teach or suggest each feature of the presently claimed invention and there is no motivation to modify the structure of Sasaki with the materials of Giordano to meet the claimed invention, the Examiner fails to establish a prima facie case of obviousness. See MPEP §2143. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Rejection of claims 6-8, 11 and 12 under 35 U.S.C. §103

The Examiner rejected claims 6-8, 11 and 12 under 35 U.S.C. §103 as being obvious over Sasaki in view of U.S. Patent No. 4,025,578 to Siebert ("Siebert") and further in view of U.S. Patent No. 4,510,007 to Stucke ("Stucke"). This rejection is respectfully traversed.

The problems with Sasaki discussed above with respect to the anticipation rejection apply with equal force to the present obviousness rejection.

Applicants agree that Sasaki does not disclose the use of infrared curable sealant materials. Siebert and Stucke, however, do not fill all the gaps in Sasaki. As demonstrated above, Sasaki discloses the use of a gasket only on a porous carbon plate. Combining Sasaki with Siebert and Stucke will not produce the presently claimed invention. Using the materials disclosed in Siebert and Stucke to make the gasket of Sasaki would still produce a gasket that is integral to a porous carbon separator. Neither Siebert nor Stucke disclose or suggest moving the gasket from the porous carbon separator to a non-porous fuel cell plate, as in the present invention.

Because Sasaki, Siebert and Stucke do not teach or suggest each feature of the presently claimed invention, the Examiner fails to establish a prima facie case of obviousness. See MPEP §2143. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Rejection of claim 13 and 14 under 35 U.S.C. §103

The Examiner rejected claims 13 and 14 under 35 U.S.C. §103 as being obvious over Sasaki in view of Siebert and Stucke, and further in view of EP 503864A2 to Bennett et al. ("Ciba-Geigy"). This rejection is respectfully traversed.

The problems with Sasaki discussed above with respect to the anticipation rejection apply with equal force to the present obviousness rejection.

Applicants agree that Sasaki, Siebert and Stucke do not disclose the use of air release agents and slip aids. Ciba-Geigy, however, does not fill all the gaps in Sasaki, Siebert and Stucke. As demonstrated above, Sasaki discloses the use of a gasket only on a porous carbon plate. Combining Sasaki, Siebert and Stucke with Ciba-Geigy will not produce the presently claimed invention. Using the materials disclosed in Siebert, Stucke and Ciba-Geigy to make the gasket of Sasaki would still produce a gasket that is integral to a porous carbon separator. Ciba-Geigy does not disclose or suggest moving the gasket from the porous carbon separator to a non-porous fuel cell plate, as in the present invention.

Because Sasaki, Siebert, Stucke and Ciba-Geigy do not teach or suggest each feature of the presently claimed invention, the Examiner fails to establish a prima facie case of obviousness. See MPEP §2143. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Rejection of claim 2 under 35 U.S.C. §103

The Examiner rejected claim 2 under 35 U.S.C. §103 as being obvious over Sasaki in view of U.S. Patent No. 6,274,262 to Canfield ("Canfield"). This rejection is respectfully traversed.

Applicants agree that Sasaki does not disclose the use of screen printing. One skilled in the art would not have any motivation to combine Sasaki and Canfield. They disclose two distinct methods of creating gaskets that cannot be combined. Sasaki discloses gaskets that are molded from a liquid rubber where the liquid rubber invades the pores of the carbon plate to help anchor the gasket when it is cured. Canfield, on the other hand, discloses a gasket that

is made through screen printing or as a paraphorm[1] seal on a flow plate with flow channels. Because of the flow channels, the flow plates of Canfield must be non-porous. The methods of Sasaki and Canfield are incompatible; one is designed for porous materials and the other is designed for non-porous materials. Thus, Sasaki and Canfield teach away from each other, showing that there is no motivation to combine the references.

In addition, Canfield disparages and thus teaches away from the molded gaskets used in Sasaki. At column 4, lines 25-26, Canfield states "[c]onventionally, each flow plate includes a gasket groove on its upper surface to receive a flow gasket. Thus, the gasket groove defines the 'up side' of the flow plate." One skilled in the art would understand that a molded gasket would normally be placed in the gasket groove. Canfield states that no gasket groove is needed in the flow plates and that the gasket can be applied through other methods; i.e., screen printing. Thus, one skilled in the art would not be motivated to combine Sasaki with Canfield.

Because there is no motivation to combine the structure of Sasaki with the teachings of Canfield to meet the claimed invention, the Examiner fails to establish a prima facie case of obviousness. See MPEP §2143. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

1 Although far from clear, it is believed that Canfield is referring to a beaded seal produced by Parker under Parphorm trade name. See Fig. 2 of Canfield.

CONCLUSION

For at least these reasons, this application is now in condition for allowance. It is believed that any additional fees due with respect to this paper have already been identified in any transmittal accompanying this paper.

However, if any additional fees are required in connection with the filing of this paper that are not identified in any accompanying transmittal, permission is given to charge account number 18-0013 in the name of Rader, Fishman and Grauer PLLC.

If the Examiner has any questions or comments, she is kindly urged to call the undersigned to facilitate prosecution.

Date: 10/16/02

Respectfully submitted,

Michael B. Stewart, Registration No. 36,018
Christopher J. Voci, Registration No. 45,184
Rader, Fishman and Grauer PLLC
39533 Woodward Ave., Suite 140
Bloomfield Hills, Michigan 48304
(248) 594-0650
Attorneys for Applicants
Customer No. 010291

60680-1378

MARKED UP VERSION OF AMENDED PARAGRAPHS

First full paragraph on page 6:

The coating 132, which is applied on the plates 106, 108 in a fluid state and then solidified in situ, comprises a blend of one or more reactive coating precursors that are subsequently polymerized and/or cross-linked. Here, "reactive" means that the components of the coating 132 react with one another other or self-react to cure (solidify); such materials are also referred to as thermosetting resins. Depending on the type of reactive components employed, the coating 132 can be cross-linked and/or polymerized using any number of mechanisms, including oxidative curing, moisture curing, thermal curing, high energy radiation curing (e.g., ultraviolet curing, electron beam curing), condensation and addition polymerization, and the like.